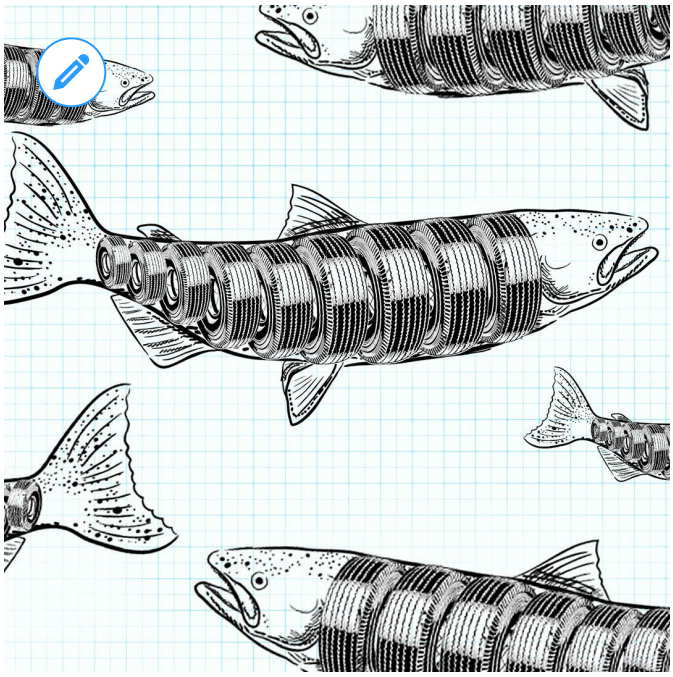

TRANSPORTATION DAILY COVER

Car Tire Dust Is Killing Salmon Every Time It Rains

ILLUSTRATION BY YUNJIA YUAN FOR FORBES; PHOTOS BY CSA-PRINTSTOCK/GETTY IMAGES; ULIMI/GETTY IMAGES

Alan Ohnsman Forbes Staff

I follow technology-driven changes that are reshaping transportation.

Following

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A growing body of research by scientists worldwide is tracking the effects of this overlooked source of automotive pollution that's been linked to the decimation of coho salmon in the Pacific Northwest and threatens other fish species.

The atmospheric river that fueled a string of heavy downpours in California this month brought much-needed water to the parched Golden State. But those billions of gallons of rain also swept a form of pollution off roads into streams, rivers and the Pacific Ocean that's of rising concern to scientists, environmentalists and regulators: particle dust created by car tires.

A growing body of research indicates that in addition to being a major source of microplastic pollution, the chemical 6PPD, an additive that's used to keep tires from wearing out, reacts with ozone in the atmosphere to form a toxic new substance scientists call 6PPD-Quinone. It's killing coho salmon and likely harms other types of fish, which exhibit symptoms resembling suffocation. The devastation of the coho, which the U.S. designates as an endangered species, has reached crisis level. In California's Central Coast, estimates suggest the fish is already close to extinction, with its population plunging from as high as 500,000 fish in the 1940s to a few thousand currently. While generally more abundant in Washington state, the population of wild coho salmon was estimated to have plunged to around 200,000, a third of the level of 2021, according to Puget Sound Institute. And while tire manufacturers say they're following the issue closely, they don't know when or if they'll have a safe alternative to 6PPD. They've been using it for decades.

“This is the DDT of our generation”

“This is the DDT of our generation,” David Troutt, head of natural resources for the Nisqually Tribe in Washington, told *Forbes*. “This thing is killing salmon every time it rains in the Puget Sound region. We can't take it anymore.”

For a half-century, emissions rules have forced carmakers to filter dirty exhaust created when engines burn gasoline and diesel fuel because it has been found to be harmful to humans and the environment. Now the shift to electric cars and trucks, in addition to curbing climate-warming carbon, promises to someday eliminate tailpipe exhaust entirely. Yet there are no regulations for the dust created by billions and billions of tires on vehicles around the world that flow into the air and water.

6PPD, a preservative in vehicle tires, keeps them from breaking down too quickly but reacts with ozone and is transformed into multiple chemicals, including a toxic chemical that researchers found is responsible for killing coho salmon. MARK STONE/UNIVERSITY OF WASHINGTON

"The latest estimate of the total amount of tire dust created every year worldwide is 6 million tons," said Nick Molden, CEO and founder of Emissions Analytics, an independent automotive research firm based in Oxford, England. The range of health risks from all that dust is still being researched, but "knowing it's made of (oil), that there's a hell of a lot of it, and we know a lot of the chemicals in it, we know it's not great. That's why we're particularly concerned."

The ill effects of tire dust on sea life in the San Francisco Bay is already a top concern for ecologists, said Rebecca Sutton, senior scientist with the San Francisco Estuary Institute. "It's a major component of microplastic pollution and the chemical ingredients within it, some of which are toxic," she said, adding it's the top source of such pollution in the Bay Area.

The rapidly rising amount of petroleum-based microplastic fouling the world's oceans, rivers and the U.S. great lakes is an area of intense research and concern, but its effects aren't yet well understood. One form of this waste, polyethylene microbeads used in cosmetics, cleaning products and toothpaste, was banned in the U.S. with a law enacted by former President Barack Obama in 2015. Multiple studies show that tiny plastic

particles, smaller than 5 millimeters, have long been absorbed by fish and sea life, but new research finds them turning up in our fruits and vegetables.

"Eventually"

The opening salvo in the tire dust battle comes this year in California, the top U.S. auto market and the state that forced automakers to use catalytic converters to cut tailpipe fumes ahead of national rules in the 1970s. Nothing so dramatic is happening this time, however.

The California Department of Toxic Substances Control expects a regulation to take effect on July 1 that, for the first time, requires manufacturers of tires containing 6PPD to list them with the state as a "priority product." It's not a ban, but rather "a requirement for all manufacturers of motor vehicle tires containing 6PPD to notify DTSC that they produce these products" and encourages them to begin looking for alternatives or ways to eliminate harm from the chemical.

It's not much, but it's the only tire pollution rule in the works right now.

California's powerful Air Resources Board, whose push for the nation's toughest auto pollution rules triggered the current shift to electric vehicles, told Forbes it isn't ready to regulate tire and brake dust, another type of non-exhaust particulate

pollution. The ARB "is still in the research phase for understanding emissions from brakes and tires and what impacts those emissions may have," said spokeswoman Melanie Turner.

The story's the same at the U.S. Environmental Protection Agency. EPA's scientific divisions are looking into the matter and collaborating with "other research groups to make new measurements of emissions from vehicle brake and tire wear," said spokeswoman Dominique Joseph. "This data will eventually be included in EPA modeling tools."

New rules on soot pollution the agency issued this month didn't reference tire dust, focusing instead on particles from sources such as smokestacks, vehicle tailpipes and powerplants.

"Our research shows the next most sensitive salmon is steelhead, and then the next most sensitive is Chinook"

MARK STONE/UNIVERSITY OF WASHINGTON

Biologists think that's a grave omission.

The "lack of teeth" in the upcoming California rule disappoints aquatic toxicologist Jenifer McIntyre, an assistant professor at Washington State University.

Initially, she thought the regulation would "force the industry to make a change. They are not required to do that,"

"People might just write off coho and say, 'maybe we don't need coho.' But we've been studying stormwater runoff for a couple of decades and our research shows the next most sensitive salmon is steelhead, and then the next most sensitive is Chinook," McIntyre said. "Other studies are also showing both of those species have some sensitivity. Others that look like they're sensitive are brook trout."

Research in Japan finds that a species of char, a salmon-like fish, is also affected by 6PPD-Quinone, she said.

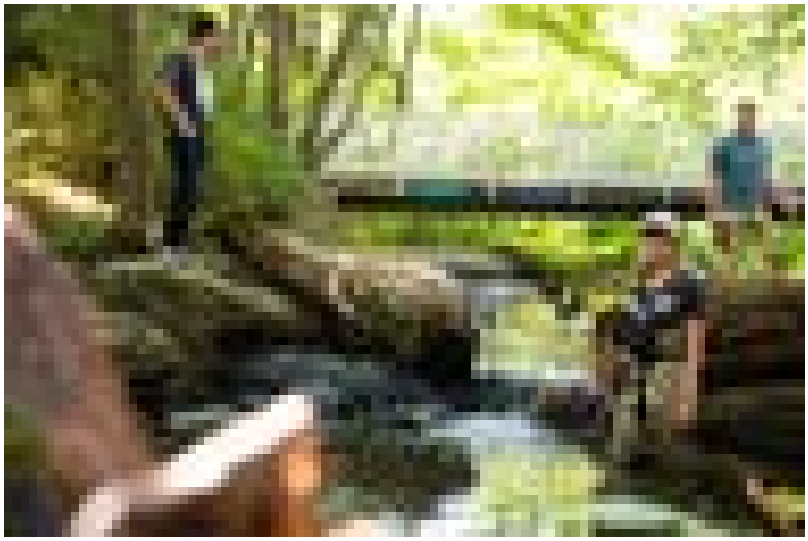
Sarah Amick, senior vice president and senior counsel for the U.S. Tire Manufacturers Association, the Washington, D.C.-based group that lobbies for companies including Bridgestone, Goodyear and Michelin, says tire makers "care deeply about the (6PPD) issue."

She said USTMA, which estimates the tire industry's annual economic impact is $171 billion, supports California's move to identify tires with 6PPD as a priority product to start the process of finding potential replacements. But she didn't say whether manufacturers have identified promising 6PPD substitutes or when they might arrive.

The Salmon Detectives

Working with scientists including Ed Kolodziej at the University of Washington and researchers from the National Oceanic and Atmospheric Administration and U.S. Fish & Wildlife Service, McIntyre's been investigating the cause of salmon deaths since the early 2000s and was part of the team that discovered 6PPD's environmental toxicity. Through an exhaustive, multiyear study of chemicals in runoff water from roads, their scientific detective work eventually found that 6PPD-Quinone, a previously unknown substance, was the culprit. In the case of coho, the toxic

compound triggers symptoms resembling suffocation, but exactly how it's killing the fish is still being researched.



Zhenyu Tian, left, a research scientist at the University of Washington, Tacoma; Jenifer McIntyre, center, assistant professor at Washington State University; and Edward Kolodziej, associate professor, University of Washington, at Longfellow Creek near Seattle. MARK STONE/UNIVERSITY OF WASHINGTON

McIntyre, along with the Nisqually Tribe's trout, were among speakers at the sole, high-level discussion of tire pollution, held back in July 2021 in a hearing held by the House of Representatives Natural Resources Committee, when Rep. Katie Porter, a Democrat from Irvine, California, chaired its subcommittee on oversight and investigations. The issue remains one of concern for Porter, who recently announced plans to run for a Senate seat in 2024.

In addition to 6PPD-Quinone's connection to salmon deaths, Porter told *Forbe*s in an email that she's concerned about health hazards from old tires used in playground surfaces. From that hearing, "we learned that this chemical is a

leading factor in the collapse of coho salmon, threatening local economies and hurting tribal communities," she said.

"Our office is still evaluating next steps, including the possibility of legislation," Porter said. "I am committed to being a partner to state, local, and tribal communities in their work to protect and revitalize the coho salmon population."

While heavy vehicles create more tire dust, tires used for the heaviest class of trucks aren't as problematic because they use more natural rubber, said Molden. "We know heavy-duty tires are generally a lot less toxic than light-duty tires because they need much more natural rubber to meet performance requirements."

"We need to do something because this stuff is killing the ecosystem"

MARK STONE/UNIVERSITY OF WASHINGTON

That's not likely to be a solution for mass-market passenger vehicles, however, because of "the lack of natural rubber," he said.

A study by the Paris-based Organisation for Economic Co-operation and Development found that non-exhaust pollution from tires and brakes can be higher for EVs than their conventional counterparts "as the heavy batteries in electric vehicles imply that they typically weigh more than similar conventional vehicles. This is particularly the case for electric vehicles with greater (driving range) that require larger battery packs."

The current lineup of Tesla, the world's top seller of electric autos, reflects this. Its popular Model Y SUV weighs in at over 4,500 pounds, half a ton more than a similarly sized, gasoline-powered Honda CR-V. The Elon Musk-led company's upcoming Cybertruck pickup may tip the scales at

8,500 pounds, challenging General Motors' gargantuan 9,000-pound electric Hummer SUV.

For markets like the U.S., which is already obsessed with heavy SUVs and pickups, tire dust is likely to be an especially big problem. "It's come into stark relief, not just because of electrification—heavier vehicles, everything else being equal, have higher tire-wear emissions—but because of the receding tide of tailpipe emissions," Molden said.

Search For Solutions

Without a viable non-toxic substitute for 6PPD, the tire industry is advocating making roadways softer and other infrastructure improvements. But that's hardly a viable short-term solution for what appears to be an emerging environmental crisis. Some in the private sector are actively pursuing potential fixes, however.

Tyre Collective, a London-based startup founded by three *Forbes* 30 Under 30 Europe alums, is developing a first-of-its-kind ionic filtration system for tire dust that it's begun testing on small electric delivery vehicles and hopes to launch as a commercial product in 2024. And Enso Tyres, also based in the U.K., says it's developing a line of tires specifically engineered for electric vehicles that it says will be more environmentally friendly by creating less dust.

Washington's Nisqually Tribe has also begun a pilot project with Seattle-based non-profit Long Live The Kings to filter 6PPD and 6PPD-Quinone out of stormwater runoff that flows into the coho salmon's environment.

An experimental filtration system has been developed to removed 6PPD and 6PPD-Quinone from stormwater runoff. LONG LIVE THE KINGS / NISQUALLY TRIBE

"We've installed a system to capture rainwater coming off the road, running it through a bioremediation, compost-based filter system," Troutt said. "We've got one year of results and it's indicating that it is successful in removing 6PPD. But this is just one point on a graph and we need more points."

"Low-Hanging Fruit"

The discovery of 6PPD's impact on salmon isn't likely to be the sole problem and it's possible there are bigger environmental calamities spurred by tire dust, said Hugo Richardson, cofounder and CTO of the Tyre Collective.

"6PPD is one of the first chemicals targeted in terms of starting some kind of regulation ... but a tire is made up of hundreds, if not thousands, of different additives and microplastics," he said. "We don't know the full extent of any of them. 6PPD is the low-hanging fruit, but this is still very much an emerging problem and we don't quite know at this stage what extent of the impact is."

Notably, the effects of 6PPD on humans aren't yet known, though research in China has found traces of it in urine samples, and higher concentrations in pregnant women, said Washington State's McIntyre.

"I can't imagine we're not going to find out soon that is having a significant impact on human health, and maybe that's what it takes to finally do something about it," Troutt said. "There are people that care about coho salmon, but we need to do something because this stuff is killing the ecosystem."

By **Alan Ohnsman**

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